Result Page

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More evaporated for air conditioners in motor vehicles with multi-chamber flat pipes
The invention refers to an evaporator for air conditioners in motor vehicles with multi-chamber flat pipes in accordance with the preamble of Claim 1. Such evaporators are either 325,844 known from the US-A-5 205,347 or the EP-A1-0. With both known evaporators at least in each case two multi-chamber flat pipes are one behind the other disposed in flow direction of the outside air, which are flowed through one-intimate in each case. The single multi-chamber flat pipes are thereby in each case in next to each other and one behind the other located groups summarized, which exhibit own round-tubular collecting tank in each case at their two end sides. It is required to connect several collecting tanks among themselves communicating in order to guarantee the flow of the evaporator in several tides with flow reversal from entry side to exit side. This construction way is already because of the large number of tubular collecting tanks and of multi-chamber flat pipes expensive.

The evaporated type mentioned with at least partial parallel circuit of the multi-chamber flat pipes mentioned are more powerful due to the possible cross counter current circuit as evaporators, is mäanderförmig folded with which a single multi-chamber flat pipe (VG. US-A-5 179,845).

The invention is the basis the object, the structure of an evaporator that initially mentioned type to association company

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chen.

This object becomes dissolved after the invention with an evaporator with the features of the preamble of Claim 1 by its characterizing features.

It can not however express with multi-chamber flat tubing heat exchangers with several parallel circuits to the application in motor vehicles, for evaporator, already known, use for two tides moving in opposite directions in flow direction of the outside air a single multi-chamber flat pipe and be attained the flow communication at the reversal side of the tides by a circular reaming of the transition pieces between the chambers of the single multi-chamber flat pipes.

These special for radiators and heater heat exchanger intended construction way requires a relative large manufacturing expenditure not only by milling, but also because of the necessary removal of the milling splinters. In addition intended is not to plan a normal multi-chamber flat pipe but it becomes a special manufacturing provided, which exhibits a solid distance strip between the chambers of the two tides moving in opposite directions in its central zone, which must be provided to the dense attachment of a central collecting tank partition between a input and an output chamber of a single collecting tank with a reaming. A dense conclusion, which is also suitable for the operating conditions of an evaporator, is not provided, but only a squeezing in the area of the flow communication between the two tides.

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A similar structure way points a combined radiator/condensor heat exchanger to the US-A-5 129,144.

A special design is intermediate wall particularly implemented by multi-chamber flat pipes with required also here.

Here avoided are to cause the flow diversion between successive tides moving in opposite directions by means of Fräsarbeit. The use of a separate tubular collecting tank for this planned means however a comparable high construction expenditure.

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Both latter known heat exchangers can be therefore no model in the sense of the object of the invention.

The invention takes up the thought of the two latter known heat exchangers to use in flow direction a single multi-chamber flat pipe only in each case.

The evaporator according to the invention creates however a construction, those the use of special forms of multi-chamber flat pipes possible, without these special forms are however required. One will be able to get along rather in the rule with normal multi-chamber flat pipes of same or also variable cross section of the individual chambers, without needing between single tides a special building method of the flat tube.

Beyond that recognized became that in the area of the flow reversal between successive tides both the mechanical integrity of the evaporator and the production of the flow communication are possible by means of a single corresponding formed sheet metal or an other corresponding acting flat part. Thereby the construction way becomes critical simplified, without any tradeoffs regarding the efficiency struck to become to have. Rather will it even simplified to cause to the adaptation at different liquid ones/gas compositions of the refrigerant an actual known progressive circuit of the free duct cross sections of the single tides (see. Claim 13). Besides also the consumed space is because of the saving of a larger number of round-tubular collecting tanks reduced. The evaporator according to invention is at least just as long-lived thereby and reliable as the known evaporators. By the smaller number thereby still simpler components and those relative simple assembly reduced itself thereby also the costs in the ratio to the known comparable evaporators.

The mentioned advantages of the evaporator according to invention become clearest, if in flow direction

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the air only in each case one multi-chamber flat pipe disposed is.

In principle possible type various in the scope of the invention of multi-chamber flat pipes is to be used, z. B. also such, which become from plumb bob-coated sheet soldered into the final profile bent and then. Is from particular importance the use of multi-chamber flat pipes formed as extruding hurry, which are with condensers and radiators already for a long time in common use and therefore on the market easily based to become to be able.

It is fundamental in the scope of the invention possible to arrange the two collecting tanks at opposite end sides of the multi-chamber flat pipes if the number hin-und of the working tides is odd. From reasons of the manufacture simplification and place saving it is however prefered, if both collecting tanks at the same end side of the multi-chamber flat pipes are disposed, so that then at the other end side the exclusive according to the invention with beads needs to be profiled sheet disposed.

The invention possible it to cut to length and at all not do regular multi-chamber flat pipes over again in the area of the respective flow reversal simple, as this in a previously known case the very expensive by milling out made is. A certain doing over again, which can take place however via simple printing, in the sense of claim 5 is however prefered. This possible not only to hold in the area of the flow reversal the coefficient of drag small but allowed it also, the building-deep of the beads, to reduce into which the single flat tubes dense engage, formed in the sheet, without making the flow area smaller within the returning range. Because the deflection made not only in the free flowinterconnecting space within the beads, but already in the end region of the single multi-chamber flat pipes, where the bent out ends of the bars of the inside of the wall of the multi-chamber flat pipes are separated and therefore transverse communication becomes possible. One knows then also within the prolonged range of the depth of the bent out bars the wall

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the multi-chamber flat pipe at least at the two flat sides additional up tulips. The effect is the same as the bending of the bars. The Auftulpung possible it to reduce the beads in the sheets wider and thus their depth with same entire passage area in the flowinterconnecting space.

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In the scope of the invention in particular two types are alternate in considerations drawn, in order to prevent other transverse communication along the sheet metal outside of the flowinterconnecting spaces of the beads in the sheet. For this can after sheet alternative (claim 7) a simple against a transition piece between the two one on the other subsequent chambers of the multi-chamber flat pipe soldered become.

If the manufacturing process does not become precise controlled however here, it would be more conceivable that it comes here to tightness disturbances. These can work against one still more, if one makes the seal after the alternative of the claim 8 not against a single bar, but against the entirety of both delimitation bars of a flowmoderate dead chamber of the multi-chamber flat pipe, if necessary bottom corresponding indenting of the sheet in the free end of this chamber and thus gained additional mechanical form closure. The term of a chamber kept free by flow does not have to mean with the fact that this chamber complete is kept free by the refrigerant. Rather nothing to it and in the particular case even prefered is to be objected, if in a flowmoderate dead chamber quite a replenishment with refrigerant made, which by the surroundings continuous is then included by heat conduction into the evaporation process, although with delay. Since with modern multi-chamber flat pipes chamber numbers from ten to three (or also more) are ssig, preferably twenty to twenty

five, provided, the flowmoderate dead putting of an individual chamber or a small number from chambers constitutes not much to purposes mechanical dense connections during the entire dimensioning of the evaporator and can in

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praxi neglected become.

Claim 9 concerns a particularly simple formation and arrangement of the two remaining tubular collecting tanks, whereby the arrangement possibility is according to claim 10 particularly stable, however again the dead putting of a chamber per collecting tank requires.

Particularly essential is the development of the invention of claim 11, which has from the invention of the claims 1 to 10 independent independent importance.

The principle consists here of the fact that with direct communication of a collecting tank with the input range of the flat tubes and/or. the first tide no uniform distribution of gas and liquid on the single connected flat tubes effected becomes. The dispatching of the flowing against refrigerant from the inlet tube to the intermediate chamber over the nozzles effected in contrast to this similar as with a stagnation pressure distributor one in the portion of liquid and gas comparison-moderated dispatching of the refrigerant to the single flat tubes. In addition, this measure is in the scope of the invention for the efficiency increase without use of additional building expenditure in the sense of the invention of use, can with other types generic in accordance with A of sser evaporators used become.

Claim 12 concerns a prefered possibility to combine the latter construction after type of a stagnation pressure distributor with the kinds of structure of the collecting tanks after the claims 9 or 10.

Claim 14 indicates a construction, with which in the frame of the object of the invention also the front end walls of the collecting tanks simple and reliable designed and mounted to become to be able.

It is not in principle precluded, the evaporator according to invention from arbitrary good heat conducting material to finished, normally from metal. For modern automotive technology typical is however the manufacture from aluminium or an aluminium alloy in the sense of claim 15, which regarding automotive technology

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the particular advantage of the lightweight construction has. Thereby a brazing metal coating is technical ripping, the collecting tank and or the sheet convenient, in order the parts of the evaporator pre-mounts anyhow and then common in a brazing metal furnace to solder to be able.

The invention becomes in the following still more near explained on the basis schematic designs at several embodiments. Show:
Fig. 1 a view of a first embodiment of an evaporator according to invention with four tides moving in opposite directions;
Fig. 4 a section toward the flow direction A of the flowing against outside air (see. Fig. 1), a variant of the evaporator in accordance with Fig. 1 with six tides moving in opposite directions;
Fig. 2 a view of an evaporator according to invention after Fig. 1 or Fig. 4, here as other variant with other connection way of inlet and outlet of the refrigerant (flow arrows B) toward the header pipes;
Fig. 3 top view on the evaporator in accordance with Fig.

2 in extending direction of the flat tubes;
Fig. 5 a cross section by a multi-chamber flat pipe with typically twenty to twenty five chambers of same free flow area, here twenty-three such chambers;
Fig. 6 in enlarged representation an alternative to the detail X in Fig. 4 concerning the dense connection of the sheet with the flat tubes;
Fig. 7 and 7a in enlarged yardstick fragmentary views of two variants of the installation of the flat tubes in beads of the sheet metal with flow communication with two successive tides moving in opposite directions, in the opinion direction of
top Fig. 2 ;
Fig. 8 in enlarged partial section of Fig. 4 the arrangement of a collecting tank with subsequent sheet bottom clarity of a variant concerning the bar form into that

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Multi-chamber flat pipes following the flow communication between two tides moving in opposite directions; and
Fig. 8a an other variant to Fig. 8 concerning different one design of the entrance-lateral collecting tank.

All indicated variants can become mutual exchanged and combined.

An evaporator 2 for air conditioners in motor vehicles is in external view in Fig. 1 shown. In Fig. 1 visible front face of the evaporator 2 is a flat side 4 of a multi-chamber flat pipe 6. This multi-chamber flat pipe 6 extended itself over the whole building-deep of the evaporator 2 measured in flow direction A of the flowing against outside air, so that thus is 6 disposed along this building-deep only a single multi-chamber flat pipe.

In the view of Fig. 1 the rear described multi-chamber flat pipe 6 are in each case with mutual equal interval other similar multi-chamber flat pipes 6 disposed, which between itself zigzag lamellas 8 inertial, which with the flat tubes by a brazing metal to a rectangular block soldered is. Without restriction of the public are in Fig. 1 of only three multi-chamber flat pipes 6 shown; actual are with practical embodiments typically five to thirty such multi-chamber flat pipes in the block mentioned disposed. The building-deep of the evaporator in flow direction A of the flowing against outside air, thus the longitudinal dimension of the cross section of the respective multi-chamber flat pipe 6, amounts to typically 50 to 100 mm and by the rear each other nesting of multi-chamber flat pipes the 6 and zigzag lamellas 8 defined building-wide typically 100 to 350 mm. The length of the single flat tubes amounts to typically 150 to 300 mm. Everything these indications relate itself on person motor vehicles, while in also the application with commercial vehicles, in particular buses, coming into question, which can be larger dimensions around a multiple one.

A cross section of a typical flat tube 6 is

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in Fig. 5 shown. This multi-chamber flat pipe exhibits here in the preferable ranges indicated at other location twenty-three individual chambers 10, which have same in each case free flow area and in each case by a bar 12 from each other separated are. Fig. thereby the typical profile of a multi-chamber flat pipe 6 made as extruded section shows 5.

In the scope of the invention it is also possible to select for special purposes the free flow area of the individual chambers different.

The refrigerant becomes in the evaporator 2 in accordance with the arrows B guided. It steps thereby by an inlet 14 (in Fig. 1) and/or. 14a (in Fig. 2) into a input collecting tank 16, runs from this in several tides moving in opposite directions through in longitudinal direction of the cross section in accordance with Fig. and then that occurs 5 successive groups of chambers 10 of the multi-chamber flat pipes 6 with an outlet 20 an output collecting tank 18, (in accordance with Fig. 1) and/or. 20a (in accordance with Fig. 2) is provided.

With the embodiment after Fig. 1 in each case are inlet 14 and outlet 20 at the outer surface of the collecting tank 16 and/or. 18 disposed, during with the variant after Fig. 2 the inlet 14a and the outlet 20a at one front surface each of the input collecting tank 16 and the output collecting tank 18 disposed is. In not represented manner also a combined arrangement could be once at a front surface and once at an outer surface provided. In addition Fig shows. 1 that concerning the special location of the arrangement of inlet and outlet at the outer surface of the respective collecting tank variability exists, z. B. here once more in the center and once more in the end region of the collecting tank without restriction of the public.

The evaporator after Fig. 1 exhibits 6 four tides moving in opposite directions in the respective multi-chamber flat pipe, while the variant after Fig. 4 six tides moving in opposite directions shows. The even number of the tides moving in opposite directions possible it, that

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to arrange input collecting tank 16 as well as the output collecting tank 18 at the same end sides of the single flat tubes, thus in the illustration of Fig. 1 both at the top of the evaporator 2. This does not exclude that collecting tank is to the one and the other collecting tank at the other end side of the flat tubes disposed, which typical for odd number of tides with flow reversal is.

The evaporators according to invention have at least two tides moving in opposite directions. The total number of the tides is upward in principle unlimited. Practical ones one will however probably get along with maximum ten tides moving in opposite directions.

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Particularly prefered is evaporators with six tides and besides still evaporators with four or eight tides, which show all the arrangement of the collecting tanks at an end side of the multi-chamber flat pipes.

It is known that during the passage of the refrigerant in the one on the other subsequent tides moving in opposite directions the ratio of liquid and gas in the refrigerant shifts in the direction of a larger gas portion. In order to compensate this effect, it is actual known to let the entire free flowflat in the tides one on the other subsequent in flow direction of the refrigerant rise gradually.

With in Fig. 1 front represented multi-chamber flat pipe are thereby the dotted groups of chambers of the single tides from each other separated. One recognizes that in the sense of the gradual progression mentioned the first tide takes a smaller

prolonged portion of the cross section of the multi-chamber flat pipe 6 and thus a smaller number of chambers than the subsequent tides, whose prolonged portion of the cross section of the multi-chamber flat pipe increases gradually. This becomes particularly significant at the cross section-moderate representation of the variant after Fig. 4. Here the one on the other subsequent tides the subsequent number of chambers have in the same multi-chamber flat pipe: 2-3-3-4-4-5 (together 21 in accordance with Fig. 5).

This progressive increase of the number of the chambers sets same free flow area of the single coming

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mern ahead. One could leave alternate in the border line also to number of chambers the same and but the free cross sections of the individual chambers with the production of the multi-chamber flat pipes in the indicated progression way different select.

The invention is concerned now in particular with the provision of the flow communication in the terminal portion of bottom flow reversal communicating with one another tides as well as an adapted simple formation of the two collecting tanks 16 and 18. The invention creates thereby also a particularly simple adaptation at different selectable progressions of a gradual change of the free flow area of the refrigerant in the one on the other subsequent tides.

The general flow communication between the one on the other subsequent tides, referred with 22, becomes after the invention in the respective final page range of the multi-chamber flat pipes of 6 in each case 24, whereby this sheet 24 at the two end sides of the multi-chamber flat pipes can be a single component in each case, that only according to whether still at this end side collecting tanks present effected by a sheet is or not, additional slots 54 for the multi-chamber flat pipe or exhibits exclusive beads 30 for the flow communication 22.

This sheet is in the represented prefered training way on the whole planar with the subsequent exceptions:
On the one hand Fig shows. 1 that the sheet 24, which end side of the multi-chamber flat pipes remote at that the collecting tanks is 6 disposed, can at the same time the function of a structure console take over and exhibits for this purpose at two lateral managing edges per a bent section 26, whereby both the edge of the sheet metal 24 supernatant over the block of the multi-chamber flat pipes 6 and the zigzag lamellas 8 and the bent sections 26 made useful in manner for assembly purposes, not implemented more near, to become to be able. This sheet serving as structure console has without restriction of the general

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heat in the represented embodiment both in Tiefenals also in width direction the same expansion as the second sheet 24 on sides of the collecting tanks 16 and 18 and can with the projection also for tasks of assembly useful made there become. The particularity consists here of the fact that the latter sheet 24 only 22 made useful with its central portion to the flow communication and otherwise into the structure of the collecting tanks 16 and 18 is also included.

In at the two end sides of the multi-chamber flat pipes 6 disposed both sheets 24 the flow communication is 22 similar in each case formed, so that it is enough to describe a single flow communication 22.

Like one particularly significant from the Fig. 7 and 7a to recognize can do, are the free ends 28 of the multi-chamber flat pipes 6 in each case over a certain depth into ever each flat tube 6 an associated bead 30 in the sheet 24 inserted, so that by the whole scope of the wall 32 of the respective flat tube an hard soldering with the sheet 24 can be made there, which is pre-coated in the connecting portion with brazing metal.

Everywhere, where a flow communication the 22 10 tides of the respective multi-chamber flat pipe 6 one on the other subsequent between the chambers is to take place, the respective bead is provided with one over the put in-deep D going out building-deep D. The excess space 34 in the respective bead, gained by the difference D minus D, 30 serves then for the flow communication between the one on the other subsequent tides in the respective single multi-chamber flat pipe within the reversal range the flow direction.

▲ top With the variant after Fig. 7 is then shown that the respective multi-chamber flat pipe 6 with easy indentation of its free end 28, or in the border line knows 30 over the put in-deep mentioned D engage also without each deformation, into the bead. This mounting option becomes in particular used if the multi-chamber flat pipe becomes 6 cut simple with the production on length. One

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however also the cut flat tube can in such a way modify still by means of a printing process that the ends 36 of the bars 12 between the chambers 10 in the area of the respective flow communication 22 in flow direction B of the refrigerant curved are bent out. This is a first measure, in order to shift and thus the building-deep D of the respective bead 30 with retention of the same free flow area of the flow communication 22 to make smaller be able a portion of the flow communication 22 already into the free end 28 of the jeweilgen multi-chamber flat pipe 6.

If then the free ends become 36 of the bars 12 with their bending out the inner surface of the wall 32 of the respective multi-chamber flat pipe during the printing process separated, one knows the possibility as the second variant in accordance with Fig. 7a use. There is shown that along the depth of the bent out ends 36 of the bars the wall 32 of the respective multi-chamber flat pipe 6 at its two flat sides 4 is cup-like aufgetulpt. From this follows a larger width of the respective bead 30, which has again to the sequence that with constant flow area within the flow communication 22 the building-deep D of the respective bead 30 again reduced can become.

It is now essential that the respective flow communication 22 in the area becomes the larger building-deep D of the respective bead 30 only there the flow communication between the one on the other subsequent chambers 10 of the respective multi-chamber flat pipe effective, where the respective flow short-circuit than flow communication between the one on the other subsequent tides with flow reversal is desired however not opposite subsequent chambers 10 preceding or subsequent tides. This means concurrent that then, if several flow communications should be 22 at an end side in each case a multi-chamber flat pipe provided a seal between the one on the other subsequent flow communications 22 must take place.

For this seal the invention sees alternate

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in particular the two possibilities forwards, which in the detail X in Fig. 4 or in the special design after Fig. 6 shown are.

The first mentioned variant in accordance with the detail X in Fig. a particularly simple possibility represents 4, which uses the structure area of the evaporator 2 maximum. Here is provided that the sheet becomes 24 in the terminal portion of the two one on the other subsequent flow communications 22 and thus in the principal plane of the sheet 24 immediate soldered hard to a bar 12 at its free end side, whereby the desired seal between the one on the other subsequent flow communications 22 results.

If one does not want to trust a single dense seam however in the reliability, how it is only present one after the before described variant, one knows bottom slight limitation of the full use of the building-deep of the evaporator the mechanical and seal-moderate firmer type in accordance with Fig. 6 use. Here is provided the fact that a chamber 10a, for which between the two one on the other subsequent flow communications 22 is appropriate is kept free by the flow with the refrigerant, which in Fig. by the fact 6 it is clarified also that in this chamber 10a no flow case B is concerning the refrigerant shown. This does not exclude the fact that the respective chamber 10a fills nevertheless as dead space of the actual flow with refrigerant and if in the evaporated process remains with included.

The sheet 24 can after the variant of Fig. 6 now with both delimitation bars 12b of the chamber 10a by brazing metal solid and dense connected, recessed from the flow, become. One can press even the sheet some more from its principal plane into the free end of the chamber 10a and the free ends of the bars 12b after type of a small Auftulpung with outward press. Develops not only pure weld seam, but an additional certain positive engagement, which beyond pure soldering the mechanical fatigue strength and continuous

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tightness ensured.

One recognizes for example by Fig. 5 that a single dead chamber at number of chambers between twenty and twenty five 4 to 5% of the building-deep of the evaporator and/or. the longitudinal extent of the cross section of the respective multi-chamber flat pipe constitutes 6. Paths of the high efficiency of the evaporator according to invention it is also justifiable to dead-add not only an individual chamber flowmoderate but even several chambers, particularly since these remain with included, as mentioned, by filling by means of refrigerants, although for bottom recess from the actual current, still into the evaporation process partly.

In prefered manner one can beyond that train such chambers, which one would like to dead-put to flowmoderate, from the beginning with a smaller free cross section.

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Up to the beads mentioned 30, the certain positive engagements into free ends of a flowmoderate dead chamber, addressed with the last variant, lOa and other special forms planned in the edge region can the sheet otherwise complete in the principal plane already addressed run, without this compellingly required is. Both sheets 24 serve thereby as finalsidemoderate mounting plates of the actual evaporated block formed of the multi-chamber flat pipes 6 at the same time and the zigzag lamellas 8.

These mounting plates have particular importance also for pre-mounting before the hard soldering of the block.

Particularly significant in the Fig. 8 and 8a is then two preferable embodiments of the collecting tanks 16 and 18 and/or. in case of of Fig. 8a of the input collecting tank 16 shown, 24 formed with which the gesamte'Mantelfläche of the collecting tank is on the one hand of an outer member 38 and on the other hand of the sheet.

In both cases the sheet 24 is provided with two outer aussensicken 40 longitudinal along the respective collecting tank, in which a free edge 42 of the outer member 38 intervenes in each case.

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With the embodiment in accordance with Fig. that has 8 outer member the form of a semicircular shell, whose free edges form the free edges 42 of the outer member 38 cooperative with the sheet.

With the variant after Fig. 8a has the input collecting tank 16 an outer member 38, which a connected forms an inlet tube 44 to the inlet 14, which over nozzles 46, which are 44 uniformly distributed over the length of the inlet tube, with an intermediate chamber 48 communicated, which is flowmoderate connected to the input ends of the flowmoderate first tide for its part. For this outer two of this distant outer flanges 43 integral with formed at the inlet tube 44 of the outer member 38 of the collecting tank, which form for their part the free edges 42 of the outer member 38, are, which into the outer aussensicken 40 engage.

Inlet 14 and/or. 14a and outlet 20 and/or. 20a are in each case 38 disposed at the outer member.

The front conclusion of both collecting tanks 16 and 18 made in each case by front end wall in shape of an employment part of 50. This is in a slot 52 (or in not represented manner in an other outside bead) of the sheet 24 preassembled and becomes then when building up the collecting tank between the sheet 24 and the inner surface of the outer member clamped, if the embodiment of the collecting tank in accordance with Fig. 8 provided is.

In case of the embodiment after Fig. 8a are to be locked the inlet tube 44 and the intermediate chamber 48 likewise front separate, for which a variety of possibilities comes into question, are it with an integral closure, are it with two front closure.

In the area of the respective collecting tank 16 or 18, D. h. the respective outside tide of the respective multi-chamber flat pipe 6, the sheet 24 exhibits ever a putting in slot 54 for one multi-chamber flat pipe each 6, so that its by the respective putting in slot 54 through-seizing free ends free with the respective collecting tank and/or. the intermediate chamber 48

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in case of of Fig. 8a to communicate can.

In order to make possible and over furthermore the outer members 38 of of the respective collecting tank dense area of of the respective formed to that the flow communications 22 sheet metal anschlie to ssen be able this, is convenient in the area of the inside located of free edge 42 of the outer member 38 not included a chamber 10b provided into the current of the refrigerant, a which smooth corresponding on the collecting tank side one on the other cut open are and on the opposite end to printed ends 36b of of the respective flat side 4 exhibit, which can release a certain depressing gap 56 for refrigerant which can be filled up however in the center, but do not have.

The sheet 24 runs adjacent flow communication 22 from that the outer member 38 out into the chamber praise, forms there an outer aussensicke 40 for the free edge 42 of the outer member 38 and runs back then into the principal plane, where in the area of the collecting tank then the putting in slots are 54 formed.

Additional one reaches into the chamber 10b and/or. into the there formed outer aussensicke 40 into this engaging free edge of the 42 of the outer member. The dimensions are so struck with the fact that the width to the chamber 10b on the one hand the incoming sheet 14 and on the other hand the free edge 42 of the outer member 38 including the layer-strong of pre-coating correspond to the material thickness to a large extent, so that the free end region of the chamber 10b can become complete dense sealed when hard soldering.

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Result Page

Evaporated for air conditioners in motor vehicles with multi-chamber flat pipes requirements for protection 1. (2) for air conditioners in motor vehicles with multi-chamber flat pipes (6), those with opposite flat sides (4) parallel disposed are more evaporated and between their flat sides with rippings, in particular zigzag lamellas (8), are provided, whereby the chambers (10) of the multi-chamber flat pipes (6) are mehrflutig in flow direction (A) of the outside air flowing against in longitudinal direction of the cross section of the multi-chamber flat pipes (6) with flow reversal of the refrigerant disposed led in the multi-chamber flat pipes (6), at the entry side and at the exit side of the refrigerant (arrows B) into those and/or. from the multi-chamber flat pipes (6) one collecting tank each (16, 18) formed is, and in the terminal portion of chambers (10), which bottom flow reversal with one another communicates, a flow communication (22) provided is, thus g e k e n n z e i C h n e t that at least two together tides in each case in chambers (10) of a in common SA, subsequent with flow reversal

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men multi-chamber flat pipe (6) guided are, and that the flow communication (22) at a sheet (24) is formed, which is formed with beads (30), into those in each case a multi-chamber flat pipe (6) with seal of its
Wall (32) against the sheet (24) inserted is and ever weils the one over the put in-deep (D) going out building-deep (D) exhibit, which is as flowinterconnecting space (22) pre seen.

2. Evaporated (2) according to claim 1, thus gekenn draws that in flow direction (A) of the air only in each case flax multi-chamber flat pipe (6) disposed is.

3. Evaporated (2) according to claim 1 or 2, net through as extruding hurry identified-calibrates formed multi-chamber flat of pipes (6).

4. Evaporated ones (2) after one of the claims 1 to 3, characterised in that both collecting tanks (16,18) at the same end side of the multi-chamber flat pipes (6) disposed are.

5. Evaporated ones (2) after one of the claims 1 to 4, characterised in that the ends (36) of the bars (12) between the chambers (10) of the multi-chamber flat pipes (6) in the area of the respective flow communication (22) in flow direction (B) of the refrigerant are bent out.

6. At least evaporated (2) according to claim 5, characterised in that along the depth of the bent out ends (36) of the bars (12) the wall (32) of the multi-chamber flat pipe (6) at the two flat sides (4) is aufgetulpt.

7. Evaporated one (2) after one of the claims 1 to 6, characterised in that following a flow communication (22) the sheet (24) against a bar (12a) in the multi-chamber flat pipe (6) sealed is.

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8. Evaporated one (2) after one of the claims 1 to 6, characterised in that following a flow communication (22) in the multi-chamber flat pipe (6) a chamber (10a) of the flow kept free and the sheet (24) against the open end of this chamber (10a) sealed is, whereby preferably the chamber (10a), kept free by the flow, has a smaller free cross section than the chambers (10), included into the flow, at least the neighbour chambers.

9. Evaporated one (2) after one of the claims 1 to 8, characterised in that at least one collecting tank (16,18) an outer member (38) exhibits, which intervenes reciprocally in one outer aussensicke each (40) of the sheet (24) sealed, putting in slots (54) for an outside tide of the multi-chamber flat pipe (6) the associated area of this multi-chamber flat pipe (6) exhibits.

10. Evaporated (, into their free ends an outer aussensicke (40) of the sheet (24) runs in 2) according to claim 9, characterized by ever a chamber (praise) of the respective multi-chamber flat pipes (6), kept free by the flow, and intervenes in the one edge (42) of the outer member (38).

11. In particular evaporated one (2) after one of the claims 1 to 10, characterised in that the input collecting tank (16) an inlet tube (44), connected to the inlet, forms, which over nozzles (46), which over the length of the inlet tube (44) distributed are, with an intermediate chamber (48) communicated, which is flowmoderate connected to the input ends of the flowmoderate first tide for its part.

12. Evaporated (2) according to claim 11 and claim 9 or 10, characterised in that for outer member (38) of the collecting tank (16) the inlet tube (44) forms and two of this off

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exhibits standing outer flanges (43), which into the outer aussensicken (40) of the sheet (24) engage.

13. Evaporated one (2) after one of the claims 1 to 12, characterised in that in flow direction (B) of the refrigerant the entire free flow area per tide gradually increases, with same flow areas of the chambers (10) their number per tide.

14. Evaporated one (2) after one of the claims 1 to 13, characterised in that with at least one collecting tank (16, 18) at least front end wall of an employment part (50) between an outer member (38) of the collecting tank and the sheet (24) formed is, whereby the employment part (50) is at least partial into an interior groove at the outer member (38) and/or an outside bead or a slot (52) of the sheet (24) inserted.

15. Evaporated one (2) after one of the claims 1 to 14, characterised in that the multi-chamber flat pipes (6), the ripping, which consists collecting tank (16,18) and/or the sheet (24) of aluminium or an aluminium alloy, preferably a AlMnl or a AlMnCu.

16. Evaporated (2) according to claim 15, characterised in that the ripping, which is collecting tank (16,18) and/or the sheet (24) brazing metal-coated.

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